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DEPARTMENTS.

SOLUTIONS OF PROBLEMS.

ARITHMETIC.

90. Proposed by **B. F. FINKEL, A. M., M. Sc.**, Professor of Mathematics and Physics, Drury College, Springfield, Mo.

Find the greatest number of inch balls that can be placed in a box 10 inches square and 5 inches deep.

Solution by **MARTIN SPINX**, Wilmington, Ohio, and the **PROPOSER.**

Using as a base a side of the box, we can place on this base, by square arrangement 50 balls. But by placing 5 balls in the first row, 4 in the second, and 5 in the third, and so on, we can place 50 balls in the first layer, there being 6 rows of 5 balls, and 5 rows of 4 balls. These eleven rows will leave .339 inches between the eleventh row and the end of the box. By placing the second layer of balls in the trihedral spaces of the first layer, the two layers will occupy a space 1 inch$+\sqrt{\{1^2-[\frac{2}{3}(\frac{1}{2}\sqrt{3})]^2\}}$ inches,$=1.8165$ inches, high.

Since the centers of the first row in the second layer are .289 inches in advance of the centers of the first row in the first layer, it follows that eleven rows can be put in the second layer, there being .339 inches$-$.289 inches, or .05 inches more room than is needed. But the second layer contains 49 balls,—the six odd rows containing 4 each and the five even rows 5 each. In this we can place in the box twelve layers,—50 balls in each of the odd numbered layers, and 49 in each of the even numbered layers. This makes a total of 594 balls.

Also solved, with different results, by *G. B. M. ZERR, CHAS. C. CROSS*, and *FREMONT CRANE.*

90. Proposed by **F. M. PRIEST**, Mona House, St. Louis, Mo.

A owes $6000 which is drawing 6% interest. He wishes to pay off the debt in six equal annual payments, the first to be due in one year. The whole portion of the claim unpaid at the end of each year to be accounted as principal, and to draw interest to the time of the next payment. Required the amount of each payment, so the six annual payments will discharge the obligation, interest and all.

I. Proposed by **P. S. BERG**, Superintendent of Schools, Larimore, N. D.; **J. A. MOORE**. Professor of Mathematics, Millsaps College, Millsaps, Miss.; **M. E. GRABER**, Mt. Eaton, O.; **MARTIN SPINX**, Wilmington, O., **M. A. GRUBER, A. M.**, War Department, Washington, D. C.

Let x=annual payment.

Put a=debt, r=rate of interest, and n=number of annual payments.

We then have the general formula,